

What's in a Number?

The Use and Abuse of Survey Data

Diane M. Simpson, MD, PhD, Lance E. Rodewald, MD, Lawrence E. Barker, PhD

The National Immunization Survey (NIS) is the latest in a series of national surveys designed to assess immunization rates in preschool children. The NIS differs from its predecessors in that it presents ongoing estimates of vaccination coverage among children aged 19 to 35 months, not only at the national level but also by state and 28 urban areas. Because all estimates are derived by the same statistical methods from the same random-digit-dial survey, results should be comparable across geographic areas, population groups, and time. Ideally, these estimates will be used to help states and surveyed urban areas to assess their current success with preschool immunizations, get a sense of population groups that are less completely immunized, and evaluate the impact of interventions over time. Programs that achieve consistently high coverage estimates can be studied for the key to their successes. States or urban areas with consistently low or steadily dropping estimates can be warned of problems before an outbreak occurs.

Calls and comments to the National Immunization Program (NIP) each time new coverage estimates are made available reveal that the ideal is not always the real. In particular, too much emphasis is placed on the point estimate of an area's vaccination coverage. It is understandable to notice, emphasize, remember, and publicize these point estimates. A single number is easiest to present to the press, politicians, and the public who want to know how their area is doing without detailed explanations. Immunization programs, however, may be asked also to interpret the point estimates beyond what is valid, for example, to explain a point estimate drop of 0.2% for an estimate within a confidence interval that spans more than ten percentage points.

Several other points need to be considered when evaluating the NIS survey data. These include:

1. National rates are based on the entire survey sample of more than 30,000 completed interviews. Conse-

quently, national vaccination coverage estimates have much smaller ($<\pm 1\%$) confidence intervals and are much more precise than state or urban-area estimates.

2. An area's vaccination coverage estimate is based on the provider-verified responses from children who live in households with telephones. Complex statistical methods are used to adjust for children whose parents refuse to participate, those who live in households without telephones, or those whose immunization histories cannot be verified through their providers.
3. The coverage rate among children aged 19 to 35 months reflects immunization practices and programs that were in place months to more than 2 years before the survey was conducted. Given the length of time required to produce and publish results, these published results may reflect immunization practices 2 years to 4 years in the past.
4. Although NIS results can provide some very useful pieces of data, each program must interpret the information correctly to determine how achievements were accomplished and to guide its future actions.

As readers review the tables of data in this supplement, we urge them to think in terms of the 95% confidence intervals constructed around the immunization coverage estimates for each geographic area surveyed in the NIS rather than in terms of the point estimates. For some this may be a difficult change to make. Past uses of point estimates to rank states and provide incentive money probably contributed to the use and misunderstanding of the accuracy of these estimates. The natural competitiveness between states and their desire or need to prove to their state governments that their immunization programs were improving are other factors that contribute to an overinterpretation of the data.

People who wish to interpret NIS data correctly must also be cognizant of the statistical limitations of confidence intervals. By definition, approximately 5% of the 95% confidence intervals (or about three states) will fail to contain the real coverage, and the true rate will fall outside of the interval. Exactly how many and which confidence intervals in any given year will fail to contain the true vaccination coverage are unknown and unknowable, but could be as few as none or as many as

From the National Immunization Program, Centers for Disease Control and Prevention, Atlanta, Georgia

Address correspondence to: Diane M. Simpson, Centers for Disease Control, 1600 Clifton Road, Mailstop E-62, Atlanta, GA 30333.

Address reprint requests to: Centers for Disease Control and Prevention, National Immunization Program Resource Center, 1600 Clifton Road NE, Mailstop E-34, Atlanta, GA 30333. Fax: (404) 639-8828.

five. Consequently, looking at an area's data over time is also valuable to achieve a correct understanding of apparent changes in coverage.

With our explanations of what NIS data do not mean, we must provide equal emphasis on what NIS data can provide to an immunization program. Even with the realization that the estimated coverage is not exact and falls within a range, the advantages of the available information are many:

1. Over time, NIS data can tell a state or local immunization program approximately where it stands with respect to various measures of preschool vaccination coverage.
2. The NIS helps track the uptake of recently introduced vaccines.
3. NIS tables provide programs with the estimated percent of children who move between providers and for whom immunization registries, with their record keeping and recall/reminder systems, may be especially beneficial.
4. The NIS calculates the proportion of children who are served by the various types of providers (e.g., public vs private) so that programs can better plan their provider-based interventions.
5. The NIS estimates the proportion of preschool children served by a provider who is enrolled in the Vaccines for Children (VFC) program. This knowl-

edge helps target enrollment into VFC so that more providers and children can benefit from the program.

6. Programs can compare vaccination coverage at different ages in the same group of children. This helps programs determine if there are specific times in a child's early life when parents delay or stop seeking immunizations, or if providers do not administer all the recommended vaccines.

In the future, the NIS will provide even more programatically valuable information with the addition of questions regarding parental attitudes toward and experiences with immunizations, the prevalence of breast feeding, and the use of daycare and how each of these factors may relate to vaccination coverage. In addition, the NIS will obtain national and state data on the proportion of children eligible for VFC and the proportion who have financial or insurance barriers to timely immunizations.

We urge immunization programs to be knowledgeable of the NIS and consciously and conscientiously place their estimations of vaccination coverage into the correct statistical context. No other childhood health initiative has the wealth of data that the NIS provides to immunization programs. We must take the responsibility to use the data wisely and well.